Plague

(Also known as Pestis)

Report Immediately

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Plague is a zoonotic disease of rodents and their fleas caused by the bacterium *Yersinia pestis*.

B. Clinical Description

The initial signs and symptoms of plague in humans are usually nonspecific, and include fever, chills, malaise, sore muscles (myalgia), nausea, sore throat, headaches, and weakness. Bubonic plague, the most common form of the disease, is a syndrome that includes painful swelling of lymph nodes. Pneumonic plague refers to a form of the illness affecting the lungs; septicemic plague is a form caused by disseminated infection of the blood stream. Meningeal plague, or plague affecting the membranes lining the brain and spinal cord, is rare. Both pneumonic and septicemic plague can be primary or they can be secondary to another form of plague. Untreated bubonic plague is fatal in 50–60% of cases, while untreated primary septicemic and pneumonic plague are fatal in 100% of cases.

C. Reservoirs

Certain wild rodents and their fleas carry *Y. pestis*. In the United States, ground squirrels and prairie dogs are the primary reservoirs of *Y. pestis*. Lagomorphs (rabbits and hares), wild carnivores (meat-eating mammals) and domestic cats may also be a source of infection to people.

D. Modes of Transmission

Plague is acquired primarily through the bite of an infected flea or through inhalation of airborne *Yersinia pestis*, either through proximity to a human or animal case of pneumonic plague or by accidental exposure in a laboratory. Plague can also be acquired by handling tissues of infected animals or by being bitten or scratched by an infected animal.

E. Incubation Period

The incubation period is from 1 to 7 days.

F. Period of Communicability or Infectious Period

Patients with pneumonic plague are considered infectious throughout their symptomatic illness and for 72 hours following initiation of antibiotic treatment. Discharge from lesions in patients with bubonic plague is considered infectious.

G. Epidemiology

Wild rodent plague exists in large areas of South America, Africa, Eastern Europe and Asia. In 1994, an outbreak of pneumonic and bubonic plague occurred in people in Surat, India. In the United States, wild rodent plague occurs primarily in ground squirrels and prairie dogs in the western part of the country. Human cases in the western United States occur sporadically, usually following exposure to wild rodents or their fleas. Approximately 10 people are diagnosed with plague each year in the United States. Between 1977 and 1994, 17

people in the US acquired plague from pet cats with pneumonic plague. No person-to-person transmission has been documented in the United States since 1925.

H. Bioterrorist Potential

Y. pestis is considered a potential bioterrorist agent. If effectively disseminated, *Y. pestis* could cause a serious public health challenge in terms of ability to limit casualties and control other repercussions. More information on bioterrorism, epidemiologic clues that may signal a bioterrorist attack and local board of health responsibility can be found in the introductory section of this manual.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. What to Report to the Massachusetts Department of Public Health

- Report any suspicion of plague called to your attention by a healthcare provider or any positive laboratory result pertaining to plague. Also report any potential exposure to plague that may be bioterrorist in nature.

Note: See Section 3) C below for information on how to report a case.

B. Laboratory Testing Services Available

The Massachusetts State Laboratory Institute (SLI) provides services for testing clinical specimens for *Y. pestis*. Laboratories should send specimens to the Reference Laboratory at SLI. Call the Reference Laboratory at (617) 983-6607 before submitting samples. In certain circumstances, the SLI may forward serology specimens to the Centers for Disease Control and Prevention (CDC).

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify potential sources of transmission in the United States (such as wild rodents or other animals).
- To identify sources of transmission and geographical areas of risk outside of the United States.
- To stop transmission from such sources.
- To identify cases and clusters of human illness that may be associated with a bioterrorist event.

B. Laboratory and Healthcare Provider Reporting Requirements

The Massachusetts Department of Public Health (MDPH) requests that healthcare providers and laboratories report to the local board of health in the community where diagnosed any suspect or known case of plague (preferably by telephone with follow up documentation via confidential fax or in writing). A case of plague is defined by the reporting criteria in Section 2) A of this chapter. Refer to the lists of reportable diseases (at the end of this manual's introductory section) for information.

Note: Due to the rarity and potential severity of plague, MDPH requests that cases, or potential exposure that might be bioterrorist in nature, be **immediately reported** to the local board of health where diagnosed. If this is not possible, call the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 (weekdays), or (617) 983-6200 (nights/weekends). A case of plague is defined by the reporting criteria in Section 2) A above.

C. Local Board of Health Responsibilities

1. **Reporting Requirements**

The MDPH requests that each local board of health (LBOH) report any suspect or known case of plague, as defined by the reporting criteria in Section 2) A to the MDPH Division of Epidemiology and Immunization,

Surveillance Program using an official MDPH *Generic Disease Reporting Form* (in Appendix A). Refer to the *Local Board of Health Reporting Timeline* (at the end of this manual's introductory section) for information on prioritization and timeliness requirements of reporting and case investigation.

2. **Case Investigation**
   a. **The most important thing a LBOH can do if it learns of a suspect or confirmed case of plague, or a potential exposure that may be a bioterrorist event, is to immediately call the MDPH, any time of the day or night.** Daytime phone numbers for the Division of Epidemiology and Immunization are (617) 983-6800 and (888) 658-2850. The phone number for nights and weekends is (617) 983-6200.

   b. Case investigation of plague in Massachusetts residents will be directed by the MDPH Division of Epidemiology and Immunization. If a bioterrorist event is suspected, the MDPH and other response authorities will work closely with LBOHs and provide instructions/information on how to proceed.

   c. Following immediate notification to the MDPH, the LBOH may be asked to assist in investigating cases that live within their communities, including gathering the following:
      1) The case's name, age, address, phone number, status (hospitalized, at home, deceased), and parent/guardian information, if applicable.
      2) The name and phone number of the hospital where the case is or was hospitalized.
      3) The name and phone number of the case's attending physician.
      4) The name and phone number of the infection control official at the hospital.
      5) If the patient was seen by a healthcare provider before hospitalization, or if the case was seen at more than one hospital, be sure to have these names and phone numbers as well.

   d. Following immediate notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Generic Disease Reporting Form* (in Appendix A). Most of the information required on the form can be obtained from the healthcare provider or the medical record. Use the following guidelines to assist you in completing the form:
      1) Record "Plague" as the disease being reported. If possible, record the type of plague (*e.g.,* bubonic, pneumonic, septicemic, or meningeal plague, or a combination of these).
      2) Record the case's demographic information.
      3) Record the date of symptom onset, symptoms, date of diagnosis, hospitalization information (if applicable), and outcome of disease (*e.g.,* recovered, died).
      4) Exposure history: use the incubation period range for plague (1–7 days). Specifically, focus on the period beginning a minimum of 1 days prior to the case's onset date back to no more than 7 days before onset for the following exposures:
         a) Travel history: determine the date(s) and geographic area(s) traveled to by the case to identify where the patient may have become infected.
         b) Activities: For bubonic plague, ask about activities *(e.g.,* hiking) that might have exposed a person to fleas.
         c) Sick animals and/or laboratory work: For pneumonic plague, ask about exposures to sick animals or about laboratory work.
      5) Complete the import status section to indicate where plague was acquired. If unsure, check "Unknown."
      6) Include any additional comments regarding the case.
      7) If you have made several attempts to obtain case information, but have been unsuccessful (*e.g.,* the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason why it could not be filled out completely.

e. After completing the form, attach lab report(s) and fax or mail (in an envelope marked "Confidential") to the MDPH Division of Epidemiology and Immunization, Surveillance Program. The confidential fax number is (617) 983-6813. Call the Surveillance Program at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Division of Epidemiology and Immunization
Surveillance Program, Room 241
305 South Street
Jamaica Plain, MA 02130

f. Institution of disease control measures is an integral part of case investigation. It is the LBOH responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4), Controlling Further Spread.

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (*105 CMR 300.2*00)

Since plague is not currently reportable by regulation in Massachusetts, no isolation and quarantine requirements currently exist under *105 CMR 300.200*. However, the following guidelines are recommended to protect the public health**.**

Minimum Period of Isolation of Patient

Droplet precautions are indicated for patients with plague until pneumonia is excluded and appropriate antibiotic therapy has been initiated. In patients with pneumonic plague, droplet precautions should be maintained for 72 hours after starting treatment. For patients with bubonic plague, standard precautions are advised.

Minimum Period of Quarantine of Contacts

See Section 4) B, Protection of Contacts, below.

B. Protection of Contacts of a Case

- Cases with pneumonic plague are considered infectious throughout their symptomatic illness and for 72 hours following initiation of antibiotic treatment. Any persons who have been in household or face-to-face contact with a case with pneumonic plague during the infectious period should be referred to their healthcare provider for antibiotic prophylaxis and be under surveillance for symptoms for 7 days. If a contact of a pneumonic plague case is unable to receive antibiotic prophylaxis, he/she should be placed under a strict quarantine for a 7-day period.
- Bubonic plague is generally not transmitted person-to-person.

C. Managing Special Situations

Reported Incidence Is Higher than Usual/Outbreak Suspected

If multiple cases of plague occur in individuals in your city/town, or if you suspect an outbreak, investigate to determine the source of infection and mode of transmission (*e.g.,* contact with diseased rodents). Cases of plague in Massachusetts are most commonly associated with travel to the western part of the United States or another country with a known outbreak. Contact the Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850 as soon as possible. The Division can help determine a course of action to prevent further cases and can perform surveillance for cases across town lines and therefore be difficult to identify at a local level.

Note: If a bioterrorist event is suspected, the MDPH and other response authorities will work closely with local boards of health and provide instructions/information on how to proceed.

D. Preventive Measures

Personal Preventive Measures/Education

To avoid cases of plague, people should reduce the likelihood of being bitten by infected fleas or being exposed to patients with pneumonic plague by:

- Understanding the modes of transmission of plague and heeding any plague advisories while visiting the southwest US.
- Preventing rodent access to food and shelter by ensuring appropriate storage and disposal of food, garbage and refuse.
- Using insect repellents while camping in rural plague-infected areas and report dead or sick animals to park rangers or public health authorities.
- Preventing flea infestations of their dogs and cats.
- Avoiding unnecessary contact with rodents or lagomorphs and using protective gloves if handling is necessary.

Additionally, for persons whose occupations put them at high risk for exposure to *Y. pestis* or plague-infected rodents, a *Y. pestis* vaccine is recommended. Also, vaccine may be considered for persons traveling to or residing in areas with epizootic or epidemic plague.

National and International Travel

- For more information regarding national/international travel and plague, contact the CDC's Traveler's Health Office at (877) 394-8747 or through the internet at <http://www.cdc.gov/travel>.

ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for plague. It is provided for your information only and should not affect the investigation or reporting of a case that fulfills the criteria in Section 2) A of this chapter. (CDC case definitions are used by the state health department and CDC to maintain uniform standards for national reporting.) For reporting a case to the MDPH always use the criteria outlined in Section 2) A.

Clinical description

- Regional lymphadenitis (bubonic plague)
- Septicemia without an evident bubo (septicemic plague)
- Plague pneumonia, resulting from hematogenous spread in bubonic or septicemic cases (secondary pneumonic plague) or inhalation of infectious droplets (primary pneumonic plague)

Laboratory criteria for diagnosis

Presumptive

- Elevated serum antibody titer(s) to *Yersinia pestis* fraction 1 (F1) antigen (without documented fourfold or greater change) in a patient with no history of plague vaccination or
- Detection of F1 antigen in a clinical specimen by fluorescent assay.

Confirmatory

- Isolation of *Y. pestis* from a clinical specimen or
- Fourfold or greater change in serum antibody titer to *Y. pestis* F1 antigen.

Case classification
Suspected: a clinically compatible case without presumptive or confirmatory laboratory results
Probable: a clinically compatible case with presumptive laboratory results
Confirmed: a clinically compatible case with confirmatory laboratory results

REFERENCES

American Academy of Pediatrics. *1997 Red Book: Report of the Committee on Infectious Diseases, 24th Edition*. Illinois, American Academy of Pediatrics, 1997.

CDC. Case Definitions for Infectious Conditions Under Public Health Surveillance, *MMWR*, 1997; 46:RR-10.

Chin, J., ed., *Control of Communicable Diseases Manual, 17th Edition*. Washington, DC, American Public Health Association, 2000.